(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 794 378 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.09.1997 Bulletin 1997/37

(51) Int Cl.[6]: **F16L 21/08**, F16L 17/10

(21) Application number: **97200573.0**

(22) Date of filing: **27.02.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
RO SI

(30) Priority: **04.03.1996 NL 1002514**

(71) Applicant: **Georg Fischer WAGA N.V.**
8161 PA Epe (NL)

(72) Inventor: **Nijsen, Dries**
7521 AT Enschede (NL)

(74) Representative: **Van Breda, Jacobus et al**
Octrooibureau Los & Stigter,
P.O. Box 20052
1000 HB Amsterdam (NL)

(54) A coupling device

(57) The invention relates to a coupling device for a tube comprising a sleeve part (1) having at least one insert end for the tube and a sealing part (3) suitable to provide a seal around the tube inserted into the sleeve part. The sealing organ comprises a plurality of substantially identical, slidably abutting elements (4) which form part of a substantially closed ring. The elements increase radially in thickness. Furthermore pressure (8,9,11;5,6) means are provided for pressing the elements against the tube.

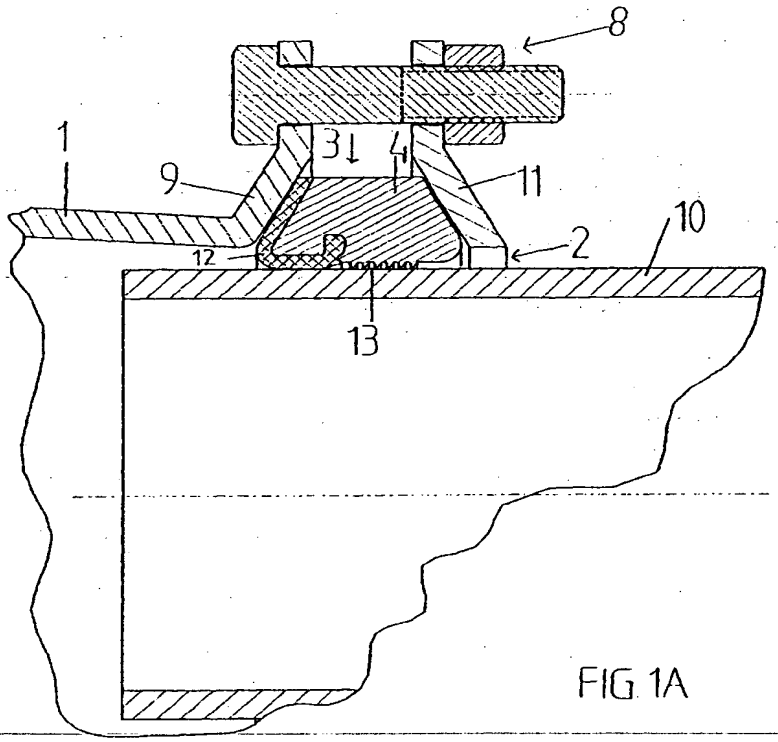

FIG. 1A

EP 0 794 378 A2

Description

The present invention relates to a coupling device for a tube comprising a sleeve part having at least one insert end for the tube and a sealing organ suitable to provide a seal around the tube inserted into the sleeve part.

Such a coupling device is known from the European patent No. 0 418 961. In this known coupling device a sealing organ is used consisting of an inner ring enclosed by a rubber sealing jacket, which inner ring is supported by supporting surfaces of the sleeve part so as to push this sealing ring against the outer wall of the tube. This known coupling device is capable of accepting and coupling tubes having different diameters so that a seal is provided for liquid, gas and solids, and tubes of different diameters and, if required, different materials can be coupled to each other.

This can be achieved with the known sealing ring because it can be compressed in circumferential direction and to a certain extent around the tube so that it is possible to adapt to the different tube diameters, while in cross-section the sealing ring retains its form relatively well.

This known device still exhibits a number of problems. First, when using the known coupling device with smaller tube diameters, the support of the sealing ring may pose a problem due to the sealing ring having to be deformed to such an extent that the sealing effect is no longer guaranteed. Another problem with the known coupling device is that it does not have sufficient tensile strength. These coupling devices are usually applied to couple underground tubes, for instance under a road. Through movement of the ground, possibly caused by traffic, such a coupling is not imbedded securely and due to displacement of sand and the like the coupling of the known coupling devices may loosen so that leakage occurs.

The invention now aims to offer a solution to these problems. To this effect the coupling device of the invention is characterized in that the sealing organ comprises a plurality of slidably abutting elements forming part of a substantially closed ring, and which elements radially increase in thickness, and which organ is further provided with pressure means for pressing the elements against the tube inserted into the coupling device.

The coupling device according to the invention provides seals which can be used both inside and outside of the tube. The pressure means serve to press the elements against the tube from the outside inward respectively from the inside outward to conform to the tube.

In this way the ring formed by the elements can, with respect to diameter, easily adapt to the tube to be sealed, while also easily accommodating irregularities in the surface of the tube. The elements could be arched but it is preferable that the elements are substantially wedge-shaped. The lateral faces forming the wedge of the wedge-shaped elements may, for instance, form an angle of 6°, in which case 60 wedge-shaped elements suffice to form the closed ring. The sealing ring may, for a part, also consist of differently shaped elements, but also other numbers of such elements are possible. For instance, if the angle between the wedge-forming lateral faces is 5°, 72 elements are required to form the closed ring. The more elements are used, the finer the distribution and closer the fit against the tube to be sealed.

The invention is based on the surprising realization that by shifting the abutting elements the elements rotate so that diameter adjustment takes place by means of the elements forming the closed ring. When applied to the outside of the tube, the desired diameter is adjusted by starting with a larger diameter and then pressing the elements by means of the pressure means against the tube, whereby adjustment to the desired diameter of the closed ring occurs automatically.

In order to obtain the required firmness of the seal it is desirable that each element is provided with a notch on a first side and a projection on a second side opposite the first side of the element, which notch and projection are suitable to interact with a corresponding projection respectively notch of an abutting element. This locks the sealing organ to prevent mutual wrenching of the elements.

The sealing effect of the coupling device according to the invention is aided by the fact that the sealing organ comprises a rubber ring, a portion at least of which is placed between the tube and the elements. It is conceivable to have the rubber ring completely surrounding the assembly of elements, but this is not necessary to achieve the aim of the invention.

In an alternative embodiment the side of the elements abutting against the tube are partly made of rubber. The tension-relieving effect of the coupling device according to the invention is achieved in particular if at least some of the elements are for a part provided with a rough surface abutting against the tube. For this there are also different options possible. For instance, one or more elements may be provided with a toothed grip element. This relieves the tension very effectively. It is, however, also possible to provide the rough surface by glueing sand grains on to the particular surface of the elements. In another embodiment the elements are provided with a grip ring extending at least over part of the circumference of the tube.

To support the tension-relieving effect at least some of the elements that are distributed evenly over the circumference of the tube may be made of a material harder than that of the tube, such as metal, and preferably stainless steel.

To optimize the close fit of the elements abutting against the tube in circumferential direction, independently of the tube's diameter discrepancies, the elements' surface abutting against the tube is arched in the circumferential direction of the tube.

Various systems could serve as pressure means for the wedge-shaped elements.

In a first embodiment of the coupling means according to the invention the pressure means for the elements are provided with a hydraulic ring-shaped chamber containing the elements which serve this chamber as a displaceable wall; the hydraulic chamber is also provided with a sealable connecting opening for the supply of a fluid to produce the hydraulic pressure in the chamber.

However, in an alternative embodiment the coupling device is executed such that the sleeve part, at least around the tube, is provided with a support surface for the elements, the diameter of which support surface in longitudinal direction of the tube decreases, respectively increases, whereby the support surface, by interaction with the elements, forms the pressure means for pressing the elements against the tube.

The invention is also embodied in a separate sealing organ and a separate wedge-shaped element such as can be applied in the coupling device according to the invention.

The invention will now be further elucidated with reference to the drawing of a non-limiting embodiment in which

Fig. 1A shows a longitudinal section through a part of a first embodiment of the coupling device according to the invention;
Fig. 1B shows a longitudinal section through a part of a second embodiment according to the invention;
Fig. 2 shows a longitudinal section through a third embodiment of a coupling device according to the invention;
Fig. 3A shows a side view of the arched elements forming a closed ring according to the invention; and
Fig. 3B a side view of the wedge-shaped elements forming a closed ring according to the invention.

Parts that are the same have the same reference numbers in the Figures.

Figs. 1A, 1B and 2 show a first, a second and a third embodiment of the coupling device according to the invention, comprising a sleeve part 1 having an insert end 2 for the tube 10 and a sealing organ 3 which is suitable for providing a seal around the tube 10 inserted into the sleeve part 1. According to the invention the sealing part 3 comprises a plurality of uniform arched or wedge-shaped elements 4; see also Fig. 3A and 3B, which show these two embodiments of the assembled elements from a side view.

As can be seen from Figs. 3A and 3B, the arched, respectively the wedge-shaped elements 4 together form a closed ring. Figs. 3A and 3B also show part of the ring after interrotation of the elements 4 which decreases the ring diameter. The embodiment of Figs. 1A, 1B and 2 further provide pressure means 5, 6, 7, 8, 9, 11 for pressing the various elements 4 against the tube 10. Each of the arched, respectively wedge-shaped elements 4 is provided with a notch (not shown) on the first side and a projection (also not shown) on a second side of element 4 situated opposite the first side, which serve for their interaction with a corresponding projection respectively notch on an abutting element 4.

Figs. 1A and 1B show that the sealing organ 3 comprises a rubber ring 12, a portion at least of which is placed between the tube 10 and the arched respectively wedge-shaped elements 4. An alternative embodiment (not shown), could be that the side of the elements 4 which abuts against the tube 10 and a support surface 9, itself is partly made of rubber.

As shown in Fig. 1A and 2, at least some of the wedge-shaped elements 4 are partly provided with a rough surface 13 abutting against the tube 10. Fig. 1B shows the embodiment which lacks the rough surface. The rough surface may be realized in different ways. It is conceivable, for instance, that a recess of the ring formed by arched respectively wedge-shaped elements 4 is provided with a punched strip having a rough surface, or that the surface of the elements 4 facing the tube 10 is provided with a rough layer, for instance of sand. The rough surface 13 further promotes the tension-relieving effect for the coupling device while the above-mentioned rubber ring 12 promotes the sealing effect of the coupling device. An alternative aid for the tension-relieving effect consists in the even distribution along the circumference of the tube 10 of arched respectively wedge-shaped elements 4 made of metal, preferably stainless steel. This is not shown in the drawing.

Preferably surface 14 (see Fig. 3A and 3B) of the arched or wedge-shaped elements 4, which is meant to abut against the tube 10, is a surface which is arched in circumferential direction of the tube and toward the tube. This results in a limited open space between the different elements 4 and the surface of the tube 10 against which they abut. In this way the arched or wedge-shaped elements 4 provide the best possible closed front in relation to the wall of the tube 10, which is important for the sealing effect of the seal 3.

Figs. 1A and 1B further show a first embodiment of the pressure means 8, 9, 11 for the wedge-shaped elements 4. The embodiment of Figs. 1A and 1B provides two support surfaces 9 and 11 which under the influence of coupling 8 can be moved toward each other, so that said support surfaces 9 and 11 exert a force on the elements 4 directed toward the tube 10.

Fig. 2 shows a further embodiment in which the side of the arched or wedge-shaped elements 4 which faces away from the tube 10 is provided with a hydraulic chamber 7 extending in ring form around the tube 10. The hydraulic chamber 7 is provided with a sealable connector opening 5 for the supply of a fluid to produce a hydraulic pressure in this chamber. This pressure acts on the elements 4 via a partition wall 6 which serves to prevent leaking of the fluid.

One of the advantages of the coupling device according to the invention is that within certain limits, determined by the form of the elements 4, the tube 10 may

be turned axially in the coupling device without lessening the sealing effect of the coupling or the tension relief.

Another advantage is that the coupling device can also be applied with a nonround tube, as the wedge-shaped elements can simply be aligned accordingly whereby, in the event that sharp angle transitions occur, intermediate pieces can be used to bridge such angle transitions.

It may further be mentioned that the coupling device according to the invention is very tolerant to repair work, in particular in the case of continuous tubes, because the ring of connected elements 4 may be broken and reassembled at any point desired.

Finally it should be mentioned that the embodiments discussed only comprise examples, and that various alternative embodiments are possible without departing from the idea of the invention as specified in the claims below.

Claims

1. A coupling device for a tube (10) comprising a sleeve part (1) having at least one insert end (2) for the tube (10) and a sealing organ (3) which is suitable to provide a seal around the tube (10) inserted into the sleeve part (1), **characterized** in that the sealing organ (3) comprises a plurality of slidably abutting elements (4) which form part of a substantially closed ring, and which elements radially increase in thickness, and which organ is further provided with pressure means (5, 6, 7, 8, 9, 11) for pressing the elements (4) against the tube (10).

2. A coupling device according to claim 1, **characterized** in that the elements (4) are substantially wedge-shaped.

3. A coupling device according to claim 1 or 2, **characterized** in that each element (4) is provided with a notch on a first side and a projection on a second side of the element (4) opposite the first side, which notch and projection are suitable for interaction with a corresponding projection respectively notch, of an abutting element (4).

4. A coupling device according to one of the preceding claims 1-3, **characterized** in that the sealing organ (3) comprises a rubber ring (12) of which at least a portion is placed between the tube (10) and the elements (4).

5. A coupling device according to claims 1-3, **characterized** in that the side of the elements (4) abutting against the tube (10) are partly made of rubber.

6. A coupling device according to one of the claims 1-5, **characterized** in that at least some elements (4) are partly provided with a rough surface (13) abutting against the tube (10).

7. A coupling device according to claim 6, **characterized** in that the rough surface (13) is a toothed grip element incorporated in the element (4).

8. A coupling device according to claim 7, **characterized** in that the elements (4) are provided with a grip ring extending at least over part of the circumference of the tube.

9. A coupling device according to one of the claims 1-8, **characterized** in that at least one or some of the elements (4) that are distributed evenly over the circumference of the tube (10) are made of a material harder than that of the tube, such as metal, and preferably stainless steel.

10. A coupling device according to one of the preceding claims, **characterized** in that the surface of the elements (4) abutting against the tube (10) in circumferential direction, is a surface arched in the circumferential direction of and toward the tube (10).

11. A coupling device according to one of the claims 1-10, **characterized** in that the pressure means for the elements (4) comprise a hydraulic ring-shaped chamber (7) containing the elements (4) which constitute a displaceable wall of this chamber (7), and that the hydraulic chamber (7) is provided with a sealable connecting opening (5) for the supply of a fluid to produce the hydraulic pressure in the chamber (7).

12. A coupling device according to one of the claims 1-10, **characterized** in that the sleeve part (1) at least around the tube (10), is provided with a tapering support surface (9, 11) for the elements (4), whereby the diameter of said support surface (9, 11) in longitudinal direction of the tube decreases, respectively increases, and whereby the support surface (9, 11), by interaction with the elements (4), forms the pressure means for pressing the elements against the tube (10).

13. A coupling device as described as part according to one of the claims 1-9.

14. An element as described as part according to one of the claims 1-9.

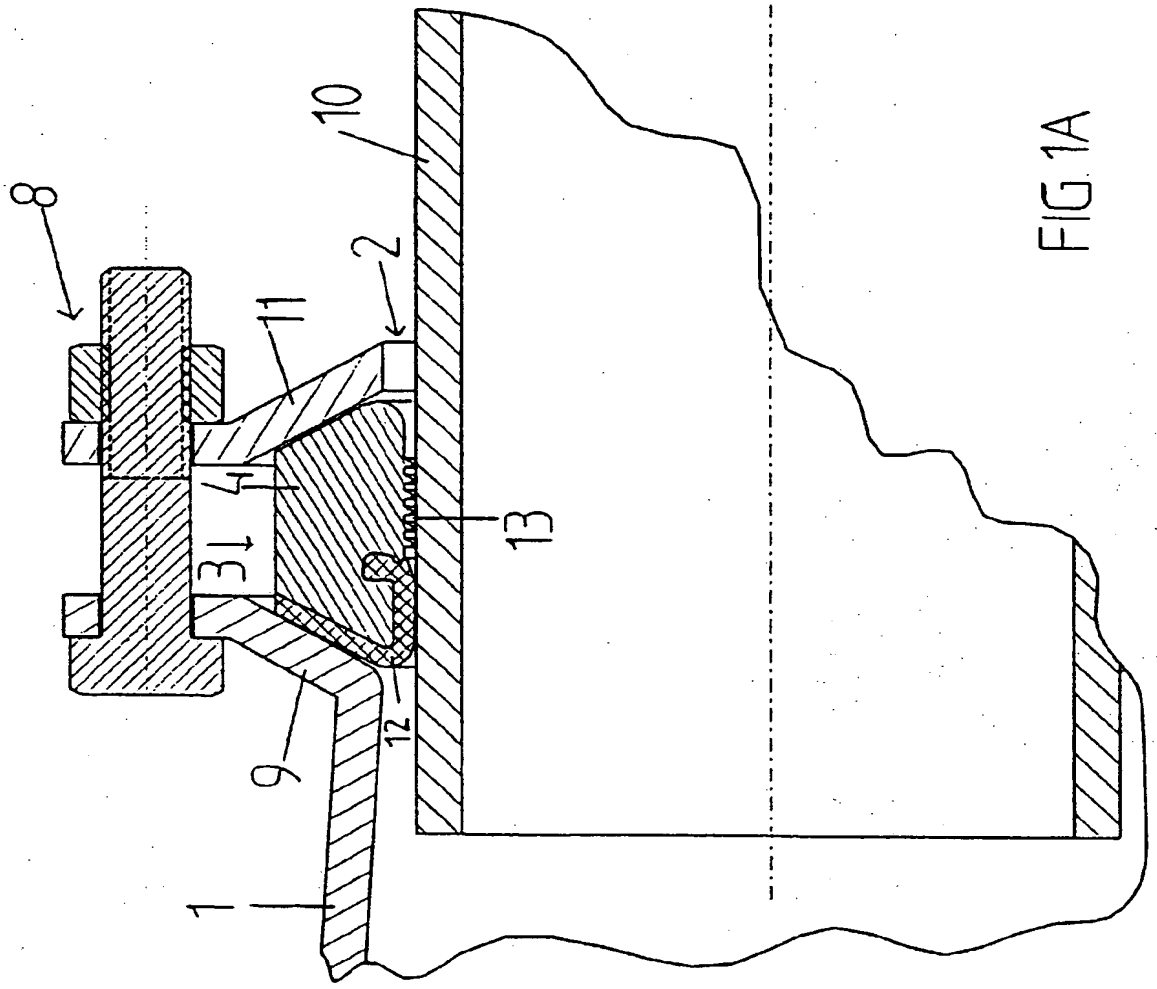

FIG 1A

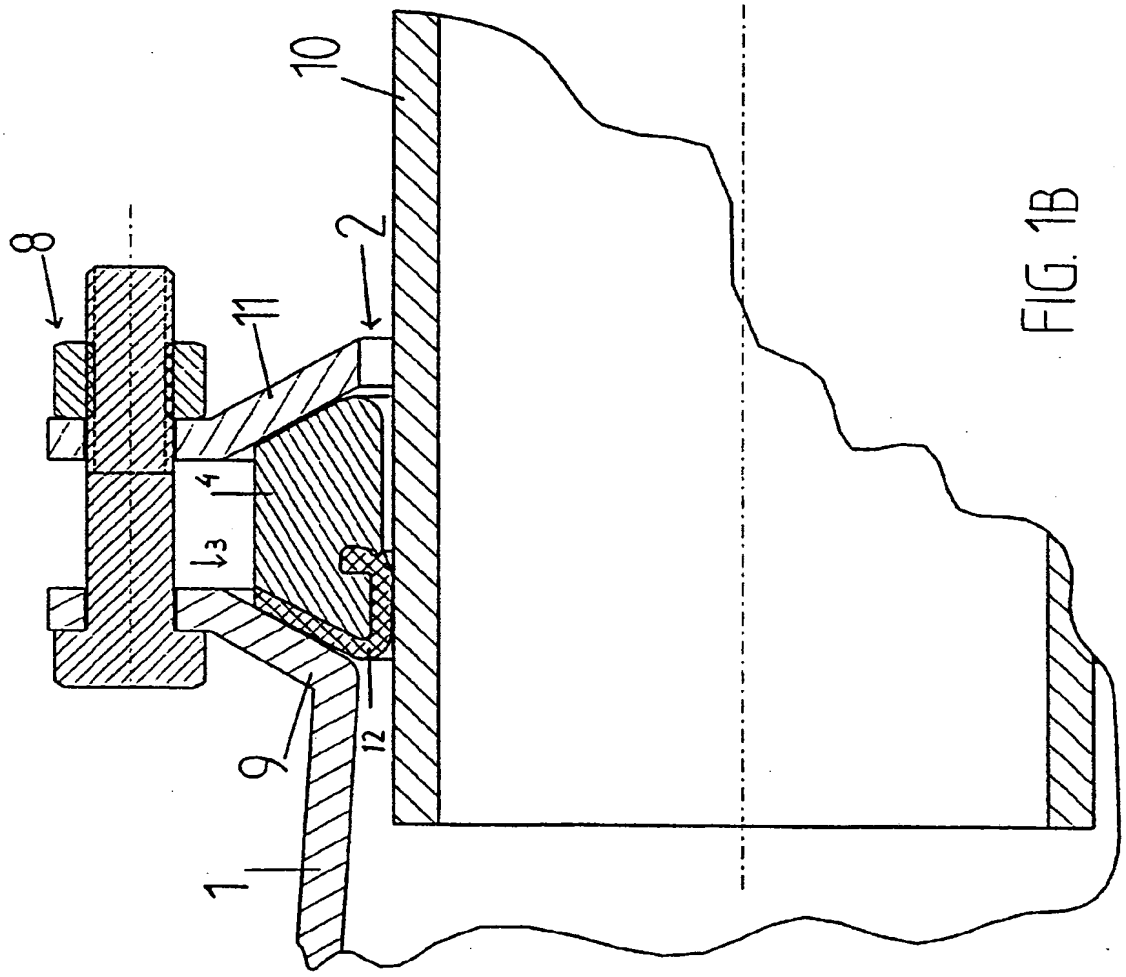

FIG. 1B

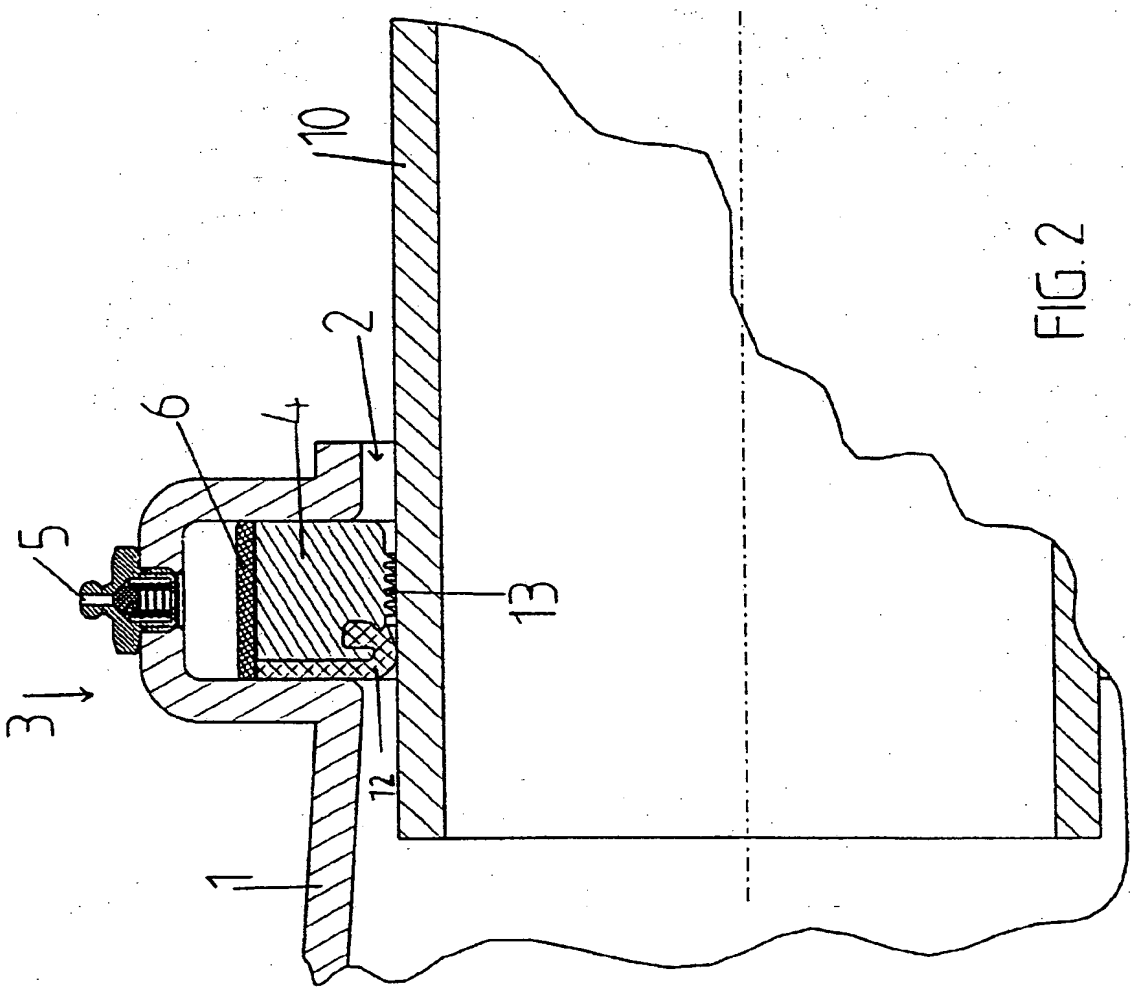

FIG. 2

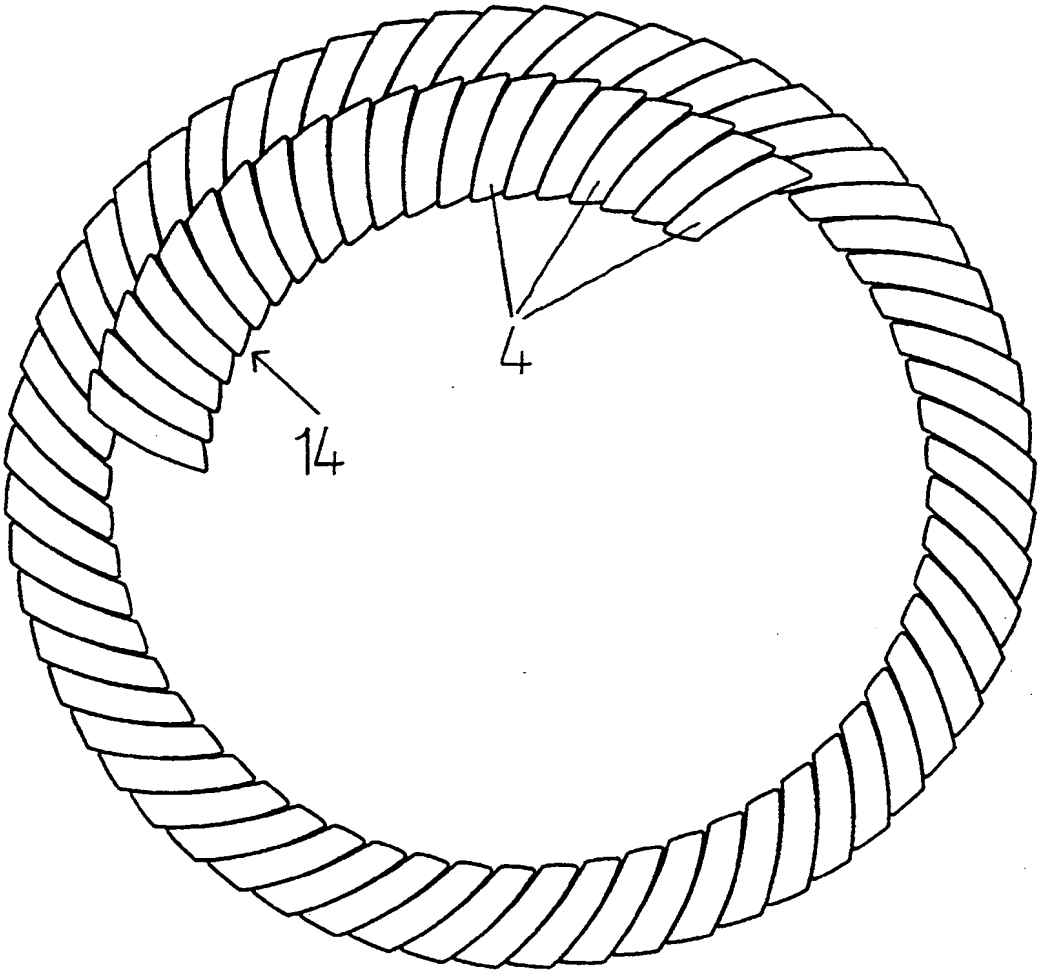

FIG. 3A

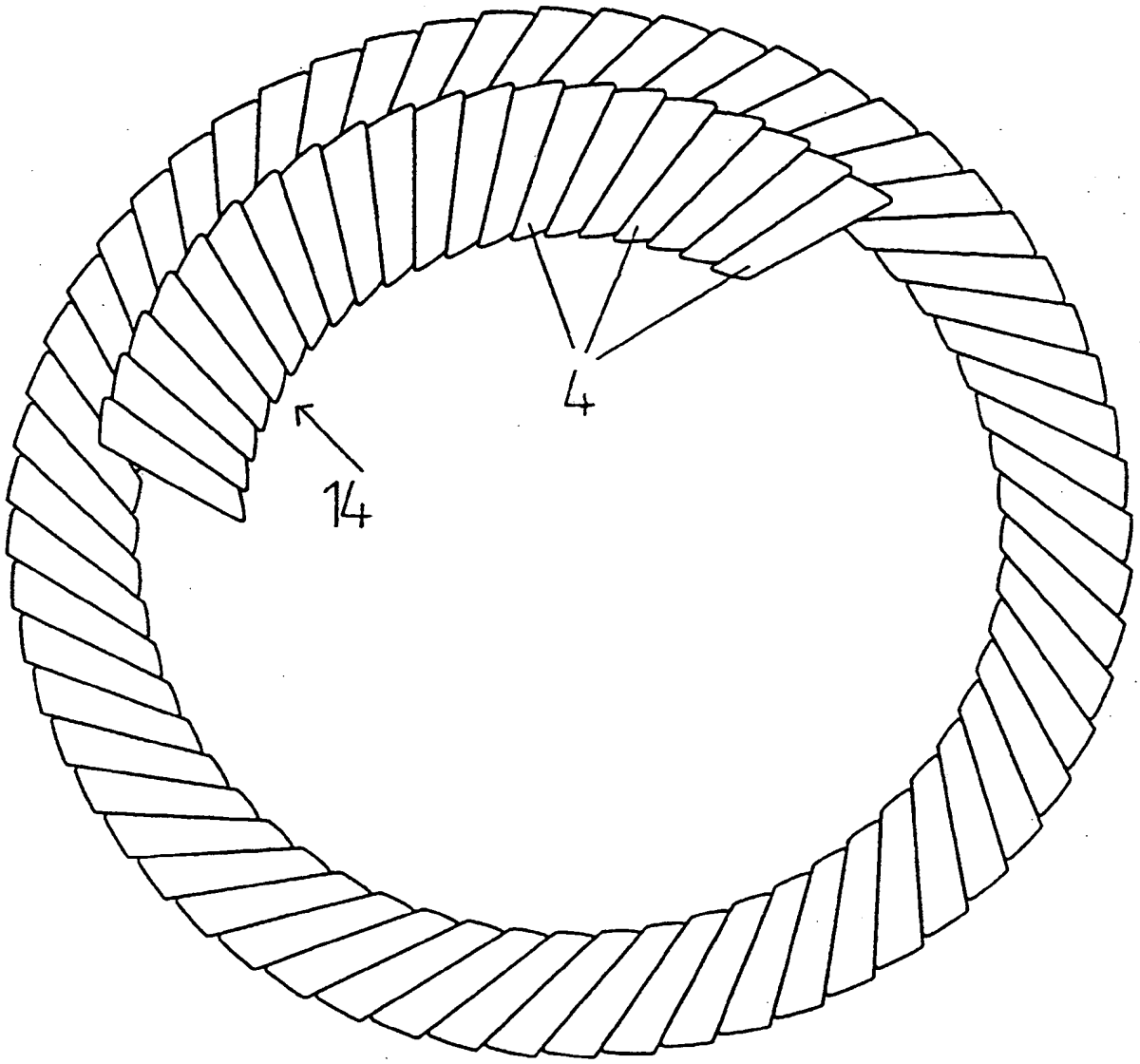

FIG. 3B

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 794 378 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
06.05.1998 Bulletin 1998/19

(43) Date of publication A2:
10.09.1997 Bulletin 1997/37

(21) Application number: **97200573.0**

(22) Date of filing: **27.02.1997**

(51) Int Cl.[6]: **F16L 21/08, F16L 17/10**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
RO SI

(30) Priority: **04.03.1996 NL 1002514**

(71) Applicant: **Georg Fischer WAGA N.V.**
8161 PA Epe (NL)

(72) Inventor: **Nijsen, Dries**
7521 AT Enschede (NL)

(74) Representative: **Van Breda, Jacobus et al**
Octrooibureau Los & Stigter,
P.O. Box 20052
1000 HB Amsterdam (NL)

(54) A coupling device

(57) The invention relates to a coupling device for a tube comprising a sleeve part (1) having at least one insert end for the tube and a sealing part (3) suitable to provide a seal around the tube inserted into the sleeve part. The sealing organ comprises a plurality of substantially identical, slidably abutting elements (4) which form part of a substantially closed ring. The elements increase radially in thickness. Furthermore pressure means (8,9,11;5,6) are provided for pressing the elements against the tube.

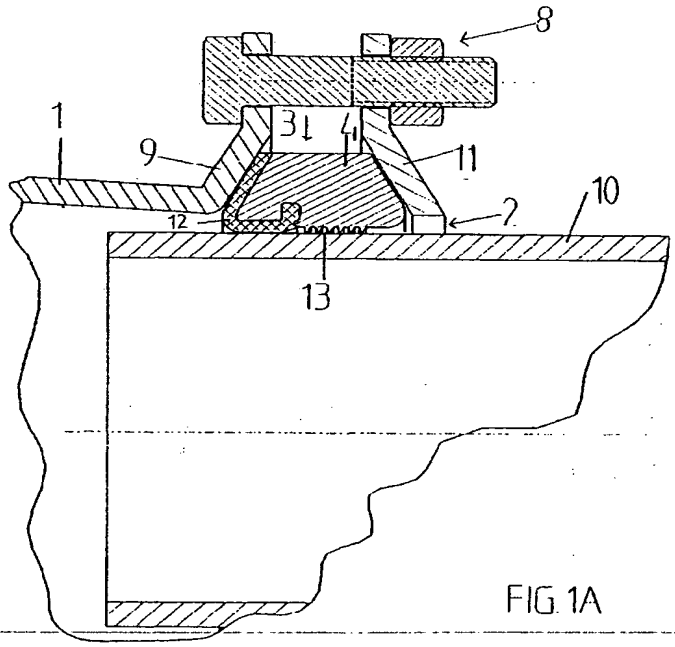

FIG. 1A

EP 0 794 378 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 20 0573

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO 95 09318 A (BALL DANIEL GRAHAM) 6 April 1995 * figures 1-4 *	1,2,4,6, 9-11	F16L21/08 F16L17/10
X	US 4 886 304 A (KUNSMAN DONALD R) 12 December 1989 * column 8, line 31 - column 8, line 55; figure 7 *	1,2,6, 10,12	
X	US 3 432 175 A (KAWAI TEIICHI) 11 March 1969 * column 2, line 6 - column 2, line 14; figures 1,2 *	1,2,9, 10,12	
X	EP 0 608 798 A (SIGLIANO SRL) 3 August 1994 * figure 5 *	1,4,5,12	
A	DE 43 33 999 A (MANIBS SPEZIALARMATUREN) 13 April 1995 * figure 3 *	3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
D,A	EP 0 418 961 A (FISCHER GEORG NV) * abstract *	1	F16L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	18 February 1998	Phlix, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)